INFORMATION FOR ADDING AMINOPYRALID AT THE PROJECT LEVEL

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In 2005, the Pacific Northwest Regional Forester amended all the Forest Plans in the region to update the invasive plant management program, including approval for the use of ten herbicide active ingredients. A site-specific project was developed on the Gifford Pinchot National Forest to follow the new management direction. In 2007, following consultation with the US Fish and Wildlife Service and National Marines Fisheries Service, the Forest Supervisor signed a Record of Decision approving treatment of invasive plants according to project design criteria.

Since that decision, a new herbicide (aminopyralid or Milestone™) has become available. Milestone is specifically labeled for wild land treatment of invasive plants. This herbicide is effective on hard to control invasive plant species such as, hawkweed, knapweed, and Canada thistle. It is preferred by invasive plant specialists at the state and county level. In 2007, the Forest Service drafted a Risk Assessment for aminopyralid. A risk assessment is required for use of any herbicide on National Forest system land (FSH reference). The risk assessments indicate aminopyralid reduces adverse ecological impacts, specifically when compared to picloram and clopyralid, two of the currently approved herbicides approved in the site-specific treatment project.

Aminopyralid is a selective herbicide (e.g. it affects broadleaf plants but not grasses) and poses lower risk to mammals, birds, honeybees, earthworms, fish and amphibians than clopyralid. U.S. EPA concluded that the use of aminopyralid as a replacement for other herbicides "will decrease risk to some non-target species."

Aminopyralid does not contain any inert ingredients, does not contain hexachlorobenzene and degrades rapidly in sunlit water (photolysis). These characteristics make aminopyralid, where effective, preferable over picloram or clopyralid.

Table 1 characterizes the comparative risk of the ten herbicides already approved for use in Region Six, along with the new proposed herbicide, aminopyralid. The comparison is based on scientific, peer reviewed herbicide risk assessments.

Table 1. Comparative risk level for Aquatic Organisms, Wildlife, Worker and Public Health and Non-target Botanical Species from 11 herbicides including aminopyralid

Risk Level	Aquatic Organisms	Wildlife	Worker Health	Public Health	Non Target Plants
LOWER	clopyralid; imazapic; metsulfuron methyl; **aminopyralid**,	chlorsulfuron; clopyralid; imazapic; imazapyr; metsulfuron methyl; **aminopyralid**	Chlorsulfuron; clopyralid; glyphosate; imazapic; imazapyr; metsulfuron methyl; chlorsulfuron; clopyralid; **aminopyralid**	chlorsulfuron; metsulfuron methyl; sulfometuron methyl; **aminopyralid**	clopyralid; picloram; sethoxydim, triclopyr
MODERATE	chlorsulfuron; imazapyr; sulfometuron methyl	glyphosate; picloram	picloram; triclopyr	Clopyralid; glyphosate; imazapic; imazapyr; picloram; sethoxydim; triclopyr	Chlorsulfuron; **aminopyralid**; metsulfuron methyl; sulfometuron methyl; imazapic, imazapyr (somewhat selective)
HIGHER	sethoxydim; glyphosate; picloram; triclopyr	triclopyr	--	--	glyphosate

Standard 16 allows us to add new chemicals with proper NEPA and ESA consultation. This paper is intended to aid Forests in documenting reasons to use and potential risks associated with aminopyralid.

Two main tasks are associated with adding this chemical:

1. Explain why aminopyralid is needed to meet desired conditions and/or management direction relative to invasive plants.

2. Summarize risk assessment information in a manner similar with other herbicides in the R6 2005 FEIS.

The following tables reflect how adding *aminopyralid* to the list of approved herbicides meets the goals, objectives, treatment/restoration standards and effects findings in the R6 2005 ROD and FEIS. This info can be integrated into your DEIS.

Table 2. Findings from R6 2005 FEIS and ROD and Effects of Aminopyralid

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Goal 1 - Protect ecosystems from the impacts of invasive plants through an integrated approach that emphasizes prevention, early detection, and early treatment. All employees and users of the National Forest recognize that they play an important role in preventing and detecting invasive plants.	No impact.	Relates to prevention, not treatment.
Goal 2 - Minimize the creation of conditions that favor invasive plant introduction, establishment and spread during land management actions and land use activities. Continually review and adjust land management practices to help reduce the creation of conditions that favor invasive plant communities.	No impact.	Relates to prevention, not treatment.
Goal 3 - Protect the health of people who work, visit, or live in or near National Forests, while effectively treating invasive plants. Identify, avoid, or mitigate potential human health effects from invasive plants and treatments.	Meets this goal by reducing amount of herbicide needed to effectively treat target weeds. Reduces risk compared to current herbicides available.	Emphasize this point in purpose and need and effects analysis.
Objective 3.1 Avoid or minimize public exposure to herbicides, fertilizer, and smoke	Aminopyralid will reduce exposure by use of lower amounts of herbicide, minimizes need for repeated treatment due to its persistence in the soil.	Minimizes risk compared to existing persistent herbicides
Objective 3.2 Reduce reliance on herbicide use over time in Region Six	Effective treatment will reduce the need for herbicide use over time.	--

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Goal 4 – Implement invasive plant treatment strategies that protect sensitive ecosystem components, and maintain biological diversity and function within ecosystems. Reduce loss or degradation of native habitat from invasive plants while minimizing adverse effects from treatment projects.	Aminopyralid would decrease level of risk to wildlife, aquatic organisms, and non-target plants compared to several approved herbicides.	Emphasize this point in purpose and need and effects analysis.
Objective 4.1 Maintain water quality while implementing invasive plant treatments.	Delivery to water would be avoided. No adverse effects on beneficial uses from minor, inadvertent herbicide contact with water.	Aminopyralid is not labeled for aquatic use but can be used near streams.
Objective 4.2 Protect non-target plants and animals from negative effects of both invasive plants and applied herbicides. Where herbicide treatment of invasive plants is necessary within the riparian zone, select treatment methods and chemicals so that herbicide application is consistent with riparian management direction, contained in Pacfish, Infish, and the Aquatic Conservation Strategies of the Northwest Forest Plan.	Non-target animals would not be exposed to harmful doses of aminopyralid used to treat invasive plants. Aminopyralid would be used according to the buffers shown in the attached proposed action, which would be consistent with existing management direction. No effect on discussion relative to ACS, Pacfish, Infish.	--
Objective 4.3 Protect threatened, endangered, and sensitive species habitat threatened by invasive plants. Design treatment projects to protect threatened, endangered, and sensitive species and maintain species viability.	No effect on endangered species – would result in reduced risk compared to other herbicides.	No programmatic consultation has been completed for aminopyralid.
Goal 5 – Expand collaborative efforts between the Forest Service, our partners, and the public to share learning experiences regarding the prevention and control of invasive plants, and the protection and restoration of native plant communities.	Collaborators have requested use of this herbicide.	--

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Standards 1-9	Prevention activities are not affected by herbicide selection.	Standards 1-9 relate to invasive plant prevention.
Standard 11 - Prioritize infestations of invasive plants for treatment at the landscape, watershed or larger multiple forest/multiple owner scale.	No impact.	Herbicide selection does not influence priority.
Standard 12 - Develop a long-term site strategy for restoring/revegetating invasive plant sites prior to treatment.	Aminopyralid may improve chance for success which could influence treatment/restoration strategy at a given site.	Herbicide selection does not directly influence long-term treatment/restoration strategy.
Standard 13 - Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities. Under no circumstances will non-native invasive plant species be used for revegetation.	No impact.	Herbicide selection is not likely to influence the use of native plant materials in revegetation.
Standard 14 - Use only APHIS and State-approved biological control agents. Agents demonstrated to have direct negative impacts on non-target organisms would not be released.	No impact.	Herbicide selection does not influence the use of biocontrols.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Standard 15 - Application of any herbicides to treat invasive plants will be performed or directly supervised by a State or Federally licensed applicator. All treatment projects that involve the use of herbicides will develop and implement herbicide transportation and handling safety plan.	No impact.	This standard applies regardless of herbicide selection.
Standard 16 - Select from herbicide formulations containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. Mixtures of herbicide formulations containing 3 or less of these active ingredients may be applied where the sum of all individual Hazard Quotients for the relevant application scenarios is less than 1.0. [1] All herbicide application methods are allowed including wicking, wiping, injection, spot, broadcast and aerial, as permitted by the product label. Chlorsulfuron, metsulfuron methyl, and sulfometuron methyl will not be applied aerially. The use of triclopyr is limited to selective application techniques only (e.g., spot spraying, wiping, basal bark, cut stump, injection). Additional herbicides and herbicide mixtures may be added in the future at either the Forest Plan or project level through appropriate risk analysis and NEPA/ESA procedures.	Amends Forest Plan to add aminopyralid to list of active herbicide ingredients.	Aminopyralid reduces HQ values (especially compared to picloram and clopyralid, which like aminopyralid are effective on broadleaf target species).
Standard 18 - Use only adjuvants (e.g. surfactants, dyes) and inert ingredients reviewed in Forest Service hazard and risk assessment documents such as SERA, 1997a, 1997b; Bakke, 2003.	No impact. Surfactants used with aminopyralid are the same as those already approved for clopyralid.	This standard applies regardless of herbicide selection.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Standard 19 - To minimize or eliminate direct or indirect negative effects to non-target plants, terrestrial animals, water quality and aquatic biota (including amphibians) from the application of herbicide, use site-specific soil characteristics, proximity to surface water and local water table depth to determine herbicide formulation, size of buffers needed, if any, and application method and timing. Consider herbicides registered for aquatic use where herbicide is likely to be delivered to surface waters.	Addition of aminopyralid to herbicide selection will help reduce negative effects by reducing amount of herbicide exposure and use of a comparatively low risk herbicide. Buffers as shown will minimize potential for herbicide to be delivered to surface waters.	Aminopyralid poses very low risk to the aquatic environment, but is not currently labeled for aquatic use. By label, water sources should not be contaminated.
Standard 20 - Design invasive plant treatments to minimize or eliminate adverse effects to species and critical habitats proposed and/or listed under the Endangered Species Act. This may involve surveying for listed or proposed plants prior to implementing actions within unsurveyed habitat if the action has a reasonable potential to adversely affect the plant species. Use site-specific project design (e.g. application rate and method, timing, wind speed and direction, nozzle type and size, buffers, etc.) to mitigate the potential for adverse disturbance and/or contaminant exposure.	Addition of aminopyralid to herbicide selection will help reduce negative effects by reducing amount of herbicide exposure and use of a comparatively low risk herbicide. Buffers as shown will minimize potential for herbicide to be delivered to surface waters.	Show how adverse effects on all federally listed species would be avoided. Low risk associated with aminopyralid.
Standard 21 - Provide a minimum buffer of 300 feet for aerial application of herbicides near developed campgrounds, recreation residences and private land (unless otherwise authorized by adjacent private landowners). Standard 22 - Prohibit aerial application of herbicides within legally designated municipal watersheds.	No impact.	--

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
Standard 23 - Prior to implementation of herbicide treatment projects, National Forest system staff will ensure timely public notification. Treatment areas will be posted to inform the public and forest workers of herbicide application dates and herbicides used. If requested, individuals may be notified in advance of spray dates	No impact.	This standard applies regardless of herbicide selection.
Page 4-18: "The herbicide listed in Standard #16 were evaluated based on their effectiveness in controlling the nineteen species covering the most acreage or considered of most threat in Region Six (see Chapter 3.1). In general, since the effectiveness of herbicides varies with site characteristics, alternatives that have the widest variety of herbicides and herbicide families available for use have the greatest potential to result in effective treatments."	Adds effectiveness by increasing effective herbicide option for broadleaf species.	Belongs to same herbicide family - pyridine carboxylic acids - as triclopyr, picloram and clopyralid.
Table 4-3: "the suite of herbicides [in Standard 16] are adequate to effectively treat knapweeds, hawkweeds, thistles, knotweeds, purple loosestrife, herb Robert, English ivy, scotch broom, false brome, rush skeletonweed, Himalayan blackberry, medusahead rye, yellow toadflax, Dalmation toadflax, leafy spurge, perennial pepperweed, tansy ragwort, sulfur cinquefoil, St. Johnswort, houndstongue, whitetop and cheatgrass."	Several of these species are hard to control or grow in sensitive habitats. Aminopyralid would provide an increased option for treatment near native grass habitats, for example infested meadow habitats that provide habitat for rare butterflies. Increases chance that herbicide treatment will be effective.	Selective, long-lasting so re-treatments are less frequent, smaller amounts used so lower potential exposures to people and environment.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
(Page 4-29): Susceptible plant species could be adversely affected by the off-site transport of picloram under a variety of different scenarios depending on local site-specific conditions that cannot be generically modeled. More tolerant plant species are not likely to be affected unless they are directly sprayed or subject to substantial drift (SERA, 2003–picloram).	Reduced impact from picloram to the extent aminopyralid is used instead. Less toxic to susceptible and non-susceptible species.	See attached table comparing HQ values for non-target plants for the ten currently approved herbicides and aminopyralid.
(Page 4-39): "If chemicals and application methods that are less damaging to non-target plants are demonstrated to be cost-effective, adjacent landowners may be more likely to use the less damaging tools."	No impact.	Collaborators are using aminopyralid and advocate its use on National Forest system lands.
(Page 4-39): "Projects that comply with the [invasive plant treatment/restoration] standards … are not likely to significantly harm native plant communities; rather … are intended and expected to restore native plant communities where they are being adversely affected by invasive plants."	No impact.	Use of aminopyralid would be consistent with this FEIS finding.
(Table 4-7): 3 herbicides (glyphosate, imazapyr, picloram) that have a relatively higher potential to harm non-target plants	No Impact.	Use PDC to ensure that aminopyralid and these three herbicides do not adversely effect non-target species, especially Species of Local Interest (SOLI).
(Table 4-7): Regionally, 8,369 acres of annual treatment with these herbicides that have a relatively higher potential to harm non-target plants.	Reduces acres of picloram.	Provide estimate acres at project scale where picloram would be replaced by aminopyralid.
(Table 4-7): 2 herbicides with known potential to cause toxic effects to harm honeybees.	No impact	Low toxicity to honeybees.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
(Page 4-37): At the project scale, adherence to Standards #16, #19 and #20 would reduce the severity and extent of impacts associated with runoff or drift. Standard #16 restricts aerial applications for the sulfonylurea group to mitigate effects from offsite drift associated with this type of herbicide. Standard #16 also restricts triclopyr to selective applications, which would reduce direct effects to non-target woody species, culturally important species, and ecto-mychorrhizal fungi. Thus, projects that follow integrated weed management principles and adhere to the standards … would largely avoid adverse effects to non-target plants (including culturally important plants) and fungi."	No impact.	Adding aminopyralid would reduce severity and extent of impacts. Aminopyralid would be used as part of an integrated weed management prescription.
(Page 4-38): At the project scale …choices can be made to avoid situations that could potentially cause adverse effects to non-target plant species. For instance, certain herbicides can be avoided in specific areas or times of the year when/where these non-target plants may be at most risk, or more specific application methods may be used. All alternatives apply integrated weed management principles, so short-term adverse effects would largely be offset by the long-term benefits of treatment."	No impact.	Protection buffers for botanical species of local interest would apply to use of aminopyralid, as well as all other herbicides.
Wildlife - "The number of plausible scenarios is estimated … based on the suite of herbicides that could be used. It indicates the number of ways that animals could be exposed to a harmful dose of herbicide."	Use of aminopyralid would not increase number of scenarios where animals may be exposed to a harmful dose of herbicide.	Demonstrate how risk of harmful scenarios to wildlife are addressed for all herbicides, including aminopyralid and how aminopyralid has less risk than other herbicides allowed in R6 2005 ROD.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
[At the regional scale] 8,989 acres [was estimated to be] treated annually with glyphosate, picloram, sethoxydim and sulfometuron methyl, posing a plausible risk to some wildlife on these acres. For these animals to be exposed to potentially harmful doses, these herbicides would have to be broadcast sprayed over a large enough area that the animal could forage exclusively within the treatment area for one day and have 100 percent of their diet contaminated."	No impact. Aminopyralid would be likely used instead of picloram and/or clopyralid. It may be used instead of glyphosate in grassy areas.	Demonstrate how risk of harmful scenarios to wildlife are addressed for all herbicides, including aminopyralid and how aminopyralid has less risk than other herbicides allowed in R6 2005 ROD.
The maximum number of plausible herbicide exposure scenarios that could result in harmful doses to birds and mammals.	No impact. Aminopyralid would be likely used instead of picloram and/or clopyralid. It may be used instead of glyphosate in grassy areas.	Demonstrate how risk of harmful scenarios to wildlife are addressed for all herbicides, including aminopyralid and how aminopyralid has less risk than other herbicides allowed in R6 2005 ROD.
Number of herbicides approved that may harm amphibians	Reduced risk to amphibians from use of aminopyralid compared to some other herbicides.	Demonstrate how risk of harmful scenarios to wildlife are addressed for all herbicides, including aminopyralid and how aminopyralid has less risk than other herbicides allowed in R6 2005 ROD.
(Page 4-61): "Another example of a potential cumulative effect is from hexachlorobenzene, a ubiquitous industrial pollutant, which is found in both picloram and clopyralid. While the amounts of hexachlorobenzene added to the environment from Forest Service use of picloram and clopyralid do not represent a substantial addition in comparison to existing background levels (SERA, 2003-picloram, SERA, 2004-clopyralid), it could be considered a cumulative effect."	Aminopyralid does not contain any hexachlorobenzene and this may reduce the amount added to the environment. The use of aminopyralid as an option replacing picloram and/or clopyralid would reduce the potential for hexachlorobenzene exposure.	Reduced exposure to the extent aminopyralid is used instead of picloram and clopyralid.

2005 FEIS and ROD Findings, Goals, Objectives and Standards	Effects of Adding Choice of New Herbicide - Aminopyralid	Comments
"The small contribution that Forest Service use of herbicide for invasive plant control makes to the statewide totals for herbicide use indicate that the potential cumulative effect on a regional scale is very small. Likewise, the relatively small differences between the alternatives, in comparison to the totals, make insignificant any differences between the alternatives in potential for cumulative effects to wildlife."	No impact.	Use of aminopyralid would not change low Forest Service herbicide use compared to statewide estimates.
(Page 4-78): Ten herbicides are available for invasive plant treatments, two of which (picloram and clopyralid) contain the carcinogenic contaminant HCB.	Aminopyralid does not contain any hexachlorobenzene and this may reduce the amount added to the environment. The use of aminopyralid as an option replacing picloram and/or clopyralid would reduce the potential for hexachlorobenzene exposure.	Reduced exposure to the extent aminopyralid is used instead of picloram and clopyralid.
"For herbicide treatments assuming typical application rates and exposure factors no worker exposures exceed an HQ of 1. For herbicide treatments assuming typical application rates and exposure factors no public exposure scenarios exceed the target HQ of 1. One accidental drinking water exposure (to NPE) to spill-contaminated water exceeds the RfD (HQ = 5).	No impact. Use of NPE surfactant is limited by PDC which reduce potential exposure. Herbicide transportation and handling safety plan minimizes risk of spill.	Like all other herbicides approved for this project, use of aminopyralid would not be associated with harmful exposure scenarios to workers or the public. Risks from the use of the surfactant NPE are not affected by approving an additional herbicide ingredient.

Aerial treatment is prohibited in Standards 16 for the sulfonylurea herbicides chlorsulfuron, metsulfuron methyl, and sulfometuron methyl, due to their potential impacts on susceptible plants (this means that drift modeled for aerial treatment could kill susceptible non-target plants). In contrast, aminopyralid poses far less risk, less than clopyralid, which is not prohibited from aerial use in Standard 16.

Table 3. Aerial Treatment Hazard Quotients (HQ) For Susceptible and Tolerant Plants from 5 Herbicides Including Aminopyralid

Herbicide	Aerial Treatment HQ's for Susceptible Plants	Aerial Treatment HQ's for Tolerant Plants
Chlorsulfuron	6363	0.4
Metsulfuron methyl	811	8
Sulfometuron methyl	1875	58
Clopyralid	700	.7
Aminopyralid	***390***	***0.7***

* An acute dose is one that occurs over a short time. A chronic dose is a smaller amount given repeatedly over time.

Table 4. Comparison of effects of aminopyralid and other herbicides on wildlife

Herbicide	Duration*	Endpoint	Dose	Species	Effect Noted at LOAEL
Aminopyralid	**Acute**	**NOAEL**	**104 mg/kg**	**Rabbit**	**Weight loss and incoordination at 260mg/kg**
	Chronic	**NOAEL**	**50 mg/kg/day**	**Rat**	**Cecal enlargement at 500 mg/kg**
Chlorsulfuron	Acute	NOAEL	75 mg/kg	Rabbit	Decreased weight gain at 200 mg/kg
	Chronic	NOAEL	5 mg/kg/day	Rat	Weight changes at 25 mg/kg/day
Clopyralid	Acute	NOAEL	75 mg/kg	Rat	Decreased weight gain at 250 mg/kg
	Chronic	NOAEL	15 mg/kg/day	Rat	Thickening of gastric epithelium at 150 mg/kg/day
	Chronic	NOAEL	45 mg/kg/day	Rat	Decreased pup growth at 120 mg/kg
Glyphosate	Acute	NOAEL	175 mg/kg	Rabbit	Diarrhea at 350 mg/kg
	Chronic	NOAEL	175 mg/kg/day	Rabbit	Diarrhea at 350 mg/kg
Imazapic	Acute	NOAEL	350 mg/kg	Rabbit	Decreased body weight at 500 mg/kg
	Chronic	NOAEL[2]	45 mg/kg	Dog	Microscopic muscle effects at 137 mg/kg
Imazapyr	Acute	NOAEL	250 mg/kg	Dog	No effects at highest doses tested
	Chronic	NOAEL	250 mg/kg/day	Dog	No effects at highest doses tested
Metsulfuron methyl	Acute	NOAEL[3]	25 mg/kg	Rat	Decreased weight gain at 500 mg/kg
	Chronic	NOAEL	25 mg/kg/day	Rat	Decreased weight gain at 125 mg/kg
Picloram	Acute	NOAEL	34 mg/kg	Rabbit	Decreased weight gain at 172 mg/kg

Herbicide	Duration*	Endpoint	Dose	Species	Effect Noted at LOAEL
	Chronic	NOAEL	7 mg/kg	Dog	Increased liver weight at 35 mg/kg[4]
Sethoxydim	Acute	NOAEL	160 mg/kg[5]	Rabbit	Reduced number of viable fetuses, some dam mortality at 480 mg/kg
	Chronic	NOAEL	9 mg/kg/day	Dog	Mild anemia at 18 mg/kg/day
Sulfometuron methyl	Acute	NOAEL	87 mg/kg	Rat	Decreased body weight at 433 mg/kg
	Chronic	NOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr[6]	Acute	NOAEL	100 mg/kg	Rat	Malformed fetuses at 300 mg/kg
	Chronic[7]	NOAEL	0.5 mg/kg/day	Dog	Effect on kidney at 2.5 mg/kg/day
	Chronic	NOAEL	1 mg/kg/day	Rat & Dog	Effects on kidney, blood, and liver at 5 mg/kg/day
NPE Surfactants	Acute	NOAEL	10 mg/kg	Rat	Slight reduction of polysaccharides in liver at 50 mg/kg/day
	Chronic	NOAEL	10 mg/kg/day	Rat	Increased weights of liver, kidneys, ovaries, and decreased live pups at 50 mg/kg/day

* An acute dose is one that occurs over a short time. A chronic dose is a smaller amount given repeatedly over time.

1 Acute values are based on chronic values; if the dose does not cause an effect over a period of 21 weeks, it is reasonable to assume that it will not cause effects after one day of exposure (SERA 2004-dicamba).

2 Imazapic – NOAEL calculated from a LOAEL of 137 mg/kg/day and application of a safety factor of 3 to extrapolate from a LOAEL to a NOAEL.

3 The acute NOAEL of 24 mg/kg is very close to the chronic NOAEL, so chronic value is used for acute exposures as well.

4 USEPA/OPP 1998.

5 Source of the value used by EPA (180 mg/kg) is not well documented, so the lower value of 160 mg/kg from a rabbit study is used as the toxicity index for this analysis.

6 Triclopyr BEE and TEA have equal toxicities to mammals (SERA, 2003a).

7 Value taken from Quast et al. 1976 as cited in SERA, 2003-triclopyr. This represents an extremely conservative approach, explained in more detail in the write up on triclopyr later in this document.

Source: SERA 1998, 2001, 2003, 2004 and USDA FS 2003, 2008.

Table 5. Comparison of effects of aminopyralid and other herbicides on birds

Herbicide	Duration*	Endpoint	Dose	Species	Effects Noted at LOAEL
Aminopyralid	**Acute**	**NOAEL**	**14 mg/kg (gavage)**	**Quail**	**Ruffled appearance at 23 mg/kg; incoordination at 63 mg/kg**
	Chronic	**NOAEL**	**184 mg/kg/day**	**Mallard**	**No significant effects at highest dose**
Chlorsulfuron	Acute	NOAEL	1686 mg/kg	Quail	No significant effects at highest dose
	Chronic	NOAEL	140 mg/kg/day	Quail	No significant effects at highest dose
Clopyralid	Acute	NOAEL	670 mg/kg	Mallard & Quail	No signs of toxicity reported, LOAEL not determined
	Chronic1	NOAEL	15 mg/kg/day	Rat	Thickening of gastric epithelium at 150 mg/kg/day
Glyphosate	Acute	NOAEL	562 mg/kg	Mallard & Quail	No effects at highest dose
	Chronic	NOAEL	100 mg/kg	Mallard & Quail	No effects on reproduction at highest dose
Imazapic	Acute	NOAEL	1100 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	113 mg/kg/day	Quail	Decreased weight gain in chicks at 170 mg/kg/day
Imazapyr	Acute	NOAEL	674 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	200 mg/kg/day	Mallard & Quail	No effects at highest dose
Metsulfuron methyl	Acute	NOAEL	1043 mg/kg	Quail	No significant effects at highest dose
	Chronic	NOAEL	120 mg/kg/day	Mallard & Quail	No significant effects at highest dose
Picloram	Acute	NOAEL	1500 mg/kg	Chicken & pheasant	No effect to reproduction. LOAEL not reported
	Chronic3	NOAEL	7 mg/kg/day	Dog	Increased liver weight at 35 mg/kg/day
Sethoxydim	Acute	LOAEL	>500 mg/kg	Mallard & Quail	No or low mortality at highest doses tested. LOAEL not available.
	Chronic	LOAEL4	10 mg/kg/day	Mallard	Decreased number of normal hatchlings at 10 mg/kg/day

Herbicide	Duration*	Endpoint	Dose	Species	Effects Noted at LOAEL
Sulfometuron methyl	Acute	LOAEL	312 mg/kg	Mallard	Decreased weight gain at 625 mg/kg/day
	Chronic5	LOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr BEE6	Acute	LD50	388 mg/kg	Quail	50% mortality at 388 mg/kg
	Chronic	NOAEL	10 mg/kg/day	Mallard & quail	Decreased survival of offspring, reduced eggshell thickness at 20 mg/kg/day
Triclopyr TEA	Acute	LD50	535 mg/kg	Quail	50% mortality at 535 mg/kg
	Chronic	NOAEL	10 mg/kg/day	Mallard & Quail	Decreased survival of offspring, reduced eggshell thickness at 20 mg/kg/day
NPE Surfactants9	Acute	LOAEL	10 mg/kg	Rat	Slight reduction of polysaccharides in liver at 50 mg/kg/day
	Chronic	LOAEL	10 mg/kg/day	Rat	Increased weights of liver, kidneys, ovaries, and decreased live pups at 50 mg/kg/day

1 Chronic toxicity studies in birds are not available, so the value from mammal studies is used.
2 Acute values are based on chronic values; if the dose does not cause an effect over a period of 21 weeks, it is reasonable to assume that it will not cause effects after one day of exposure (SERA 2004-dicamba).
3 Chronic toxicity studies in birds are not available, so the value from mammal studies is used.
4 Based on one study in which a NOAEL was not determined, so the LOAEL is used.
5 Birds may be somewhat less sensitive than mammals, but data are limited, so the lower value from mammal studies is used.
6 Unlike in mammals, the toxicities of triclopyr BEE and triclopyr TEA are different for birds, so the indices of the two forms of triclopyr are presented separately
7 Weed Science Society of America 2002.
8 No chronic toxicity data for birds is available; so the mammal chronic value is used. Acute toxicity of 2,4-D to mammals is somewhat lower than it is for birds.
9 Data on birds is not available in published literature, so values from mammals are used.
Source: SERA 1998, 2001, 2003; USDA FS 2003; and Weed Science Society of America 2002, SERA 2007.

Table 6. Comparison of effects of aminopyralid and other herbicides on fish

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
Aminopyralid	Acute	NOEC	50 mg/L	Rainbow trout	Partial loss of equilibrium at 100 mg/L[A]
	Chronic	NOEC	**1.36 mg/L**	Fathead minnow	Reductions in fry weight, length, larval survival, and % normal larvae at 2.44 mg/L
Chlorsulfuron	Acute	NOEC	2 mg/L (1/20th of LC50)	Brown trout	LC50 at 40 mg/L
	Chronic	NOEC1	3.2 mg/L	Brown trout	rainbow trout length affected at 66mg/L
Clopyralid	Acute	NOEC	5 mg/L (1/20th of LC50)	Rainbow trout	LC50 at 103 mg/L
	Chronic				none available
Glyphosate (no surfactant)	Acute	NOEC	0.5 mg/L (1/20th/LC50)	Rainbow trout	LC50 at 10 mg/L
	Chronic	NOEC	2.57 mg/L2	Rainbow trout	Life-cycle study in minnows; LOAEL not given
Glyphosate with POEA surfactant	Acute	NOEC	0.065 mg/L (1/20th of LC50)	Rainbow trout	LC50 at 1.3 mg/L for fingerlings (surfactant formulation)
	Chronic	NOEC	0.36 mg/L	salmonids	estimated from full life-cycle study of minnows (surfactant formulation)
Imazapic	Acute	NOEC	100 mg/L	all fish	at 100 mg/L, no statistically sig. mortality
	Chronic	NOEC	100 mg/L	fathead minnow	No treatment related effects to hatch or growth
Imazapyr	Acute	NOEC	5 mg/L (1/20th LC50)	trout, catfish, bluegill	LC50 at 110-180 mg/L for North American species
	Chronic	NOEC	43.1 mg/L	Rainbow	“nearly significant” effects on early life stages at 92.4 mg/L
Metsulfuron methyl	Acute	NOEC	10 mg/L	Rainbow	lethargy, erratic swimming at 100 mg/L
	Chronic	NOEC	4.5 mg/L	Rainbow	standard length effects at 8 mg/L
Picloram	Acute	NOEC	0.04 mg/L (1/20th LC50)	Cutthroat trout	LC50 at 0.80 mg/L
	Chronic	NOEC	0.55 mg/L	Rainbow	body weigh and

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
				trout	length of fry reduced at 0.88 mg/L
Sethoxydim	Acute	NOEC	0.06 mg/L (1/20th LC50)	Rainbow trout	LC50 of Poast at 1.2 mg/L3
	Chronic	NOEC			none available
Sulfometuron methyl	Acute	NOEC	7.3 mg/L	Fathead minnow	No signs of toxicity at highest doses tested
	Chronic	NOEC	1.17 mg/L	Fathead minnow	No effects on hatch, survival or growth at highest doses tested
Triclopyr acid	Acute	NOEC	0.26 mg/L (1/20th LC50)	Chum salmon	LC50 at 5.3 mg/L4
	Chronic	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
Triclopyr BEE	Acute		0.012 mg/L	Bluegill sunfish	LC50 at 0.25 mg/L
	Chronic4	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
NPE Surfactants	Acute6	NOEC	0.2 mg/L (1/20th LC50)	fathead minnow, rainbow trout	LC50 at 4.0 mg/L
	Chronic7	NOEC	1.0 mg/L	trout	no LOEL given

Table 7. Exposure results for listed fish, using the lowest of either the EPA value of 1/20th of the acute LC50, or the chronic NOEC from data on the most sensitive species for which adequate data is available.

-- Predicted concentrations are less than the estimated or measured 'no observable effect concentration'
✱ Predicted concentrations greater than the estimated or measured 'no observable effect concentration' at typical and highest application rates
♦ Predicted concentrations greater than the estimated or measured 'no observable effect concentration at highest allowed application rates only

	Aminopyralid	Chlorsulfuron	Clopyralid	Glyphosate no surfactant	Glyphosate with surfactant	Imazapic	Imazapyr	Metsulfuron Methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr TEA	Triclopyr BEE	NPE Surfactant
ACUTE EXPOSURES														
Fish	--	--	--	✱[1]	✱[2]	--	--	--	✱[2]	✱[2]	--	✱[2]	✱[2]	--
Aquatic invertebrates	--	--	--	--	♦	--	--	--	--	--	--	--	♦	--
Algae	--	♦	--	--	♦	--	✱	--	--	--	♦	♦	✱	--
Aquatic plants	--	✱	--	--	--	♦	✱	✱	♦	--	✱	♦	✱	--
CHRONIC EXPOSURES														
Fish	--	--	--	--	--	--	--	--	--	--	--	--	N/A	--
Aquatic invertebrates	--	--	--	--	--	--	--	--	--	--	--	--	N/A	--
Algae	--	--	--		--	--	--	--	--		--		N/A	--
Aquatic plants	--	--	--	--		--	--	--	--	--	--	--	N/A	--

Table 8. Characteristics and Risks of aminopyralid compared to other herbicides effective on broadleaf target species.

	Aminopyralid	Clopyralid	Picloram	Comments
Selectivity	Same as Clopyralid	Extremely SELECTIVE for MOST ALL broadleaves. Post emergent herbicide. Grasses are tolerant.	Selective: rate and season dependant	As with all herbicides, care must be taken to reduce non-target vegetation impacts to susceptible species.
Soil Activity	Soil Active, Degraded by soil microbes, Low toxicity to soil organisms	Degraded by soil microbes, Low toxicity to soil organisms	Soil Active. Microbial activity inhibition likely at rates used by FS.	PDC and buffers limit picloram use. Aminopyralid and clopyralid can be used closer to surface water bodies.
Half Life in Water	Degrades in water in 0.6 day in sunlight. Half-lives longer in water that is not exposed to sunlight.	8-40 days	2.6 days.	Aminopyralid is rapidly broken down in water that is exposed to sunlight. Longevity in ground water addressed by following label directions and additional PDC (for instance no application within 200 feet of wells).
Half Life in Soil	Range 5-89 days. Relatively rapid breakdown reduces potential for run-off or leaching.	Average 40 days (range 12-70 days). Relatively rapid breakdown reduces potential for run-off or leaching	Average 90 days (range 20-300 days). Higher potential for run-off and leaching.	Aminopyralid would be used in a manner similar to clopyralid.
Soil Mobility	Monitoring showed high soil mobility. Clay soils are of concern. 0.01 % of that applied may reach stream after first significant rainfall	Monitoring showed very high mobility in soil. High soil mobility. Clay soils are of concern. 0.01 % of that applied may reach stream after first significant rainfall.	Monitoring showed very high mobility in soil. 1-6% of application mobilized and reached drainage channels after first significant rainfall.	PDC and buffers to prevent substantial water contamination for these herbicides. Aminopyralid would be used in a manner similar to clopyralid. Clay soils would be identified during implementation planning and PDC applied.
Human Health	Little to no risk to workers or public from proposed use. Drinking water not affected.	Little to no risk to workers or public from proposed use. Drinking water not affected.	Little to no risk to workers or public from proposed use. Drinking water not affected.	Exposures below a level of concern, PDC further reduce exposure

	Aminopyralid	Clopyralid	Picloram	Comments
Bio-Concentration Potential	Does not bioaccumulate or bio-concentrate. Rapidly adsorbed and excreted and is not substantially metabolized in mammals.	Does not bioaccumulate or bio-concentrate. Rapidly adsorbed and excreted and is not substantially metabolized in mammals.	Does not bioaccumulate or bio-concentrate. Rapidly adsorbed and excreted and is not substantially metabolized in mammals.	No concern.
HCB	None	Contaminated with hexachlorobenzene (HCB) (less than that in picloram). HCB is a persistent carcinogen and it bio-accumulates. Exposure levels far below level of concern. Does not present any substantial cancer risk.	Contaminated with hexachlorobenzene HCB (more than clopyralid). Exposure levels far below level of concern. Does not present any substantial cancer risk.	Reduction of HCB in environment is a positive attribute of aminopyralid.
Birds and Mammals	Low toxicity to birds and mammals	Low toxicity to birds and mammals	Low toxicity to birds and mammals	No concern.
Fish and Invertebrates	Low toxicity to fish or aquatic invertebrates	Low toxicity to fish or aquatic invertebrates	Exposures exceed level of concern for listed fish at typical and highest application rate, low toxicity to invertebrates	PDC and buffers reduce potential for picloram to enter streams. Aminopyralid would be used in a manner similar to clopyralid.
Amphibians	Using fish as surrogate, no adverse effects	Using fish as surrogate, no adverse effects	Using fish as surrogate, potential adverse effects to amphibians at typical and highest application rates	PDC and buffers to avoid use of picloram in riparian habitats.
Aquatic Plants and Algae	Aquatic plants and algae are not susceptible	Aquatic plants and algae are not susceptible	Low toxicity to algae, aquatic plants are susceptible	PDC and buffers to avoid use of picloram in riparian habitats.
Bees and Earthworms	Low toxicity to bees and earthworms	Low toxicity to bees and earthworms	Low toxicity to bees and earthworms	No concern.

References

SERA (Syracuse Environmental Research Associates, Inc.). 2007. Aminopyralid Human Health and Ecological Risk Assessment

Milestone EPA Fact Sheet and Product Label

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